8 CHANNEL 24 BIT DIGITAL/ANALOG CONVERTER

Users Manual

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## Users Manual

Statement of conformity

#### To whom it may concern

This letter is our statement of conformity to the appropriate CE certifications. Based on testing performed in November 1998, our products, swissonic AD24 and swissonic DA24meet all pertinent worldwide regulations, including CE. This certification is based on test reports generated by EMC-Testcenter Zürich AG, Zurich, Switzerland. Copies of the reports are available upon request.

Uznach, September 15, 1999

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Quick Start Connect your digital source to the ADAT In port from the rear panel. Connect your audio equipment to the OUT 1-8 connectors from the rear panel. Power the unit using the power supply found in the package. Set the De-emphasis off. Set the Resolution according to vour digital source. Power the unit. Wait for the LOCK LED to turn on. Enjoy your 24-bit quality sound.

> Never connect anything except an approved Swissonic power supply to the power jack. This is a 12 V AC input and requires special care if you do not have a power supply exactly like the one originally packed with your unit.

> This unit does not ground the chassis through the power cord. Make sure that the unit is grounded either to another chassis that is earth-grounded, or directly to the grounding screw on an AC outlet.

#### Brief description

The DA24 unit is a 24-bit 8-channel D/A converter capable of operation at 44.1 kHz and 48.0 kHz sample rates, with the possibility of muting the lower 8 bits in order to permit 16bit ADAT operation. The state-ofthe-art technology level and the extreme simplicity in operation, together with a very reasonable cost makes the DA24 unit the obvious choice for the all range of digital audio applications.

#### Package contents

One DA24 unit; one 4 m optical fiber cable; one power adapter; one manual; warranty information.

#### Features

- True 24-bit Crystal Digital-Analog converters;
- 128x oversampling architecture:
- Low clock jitter sensitivity:
- 115 dB SNR(EIAJ):
- Balanced XLR outputs (+4 dB);
- Two-LED level monitoring with digital level detectors:
- Wordclock output;
- 44,1 and 48,0 kHz Sampling rates;
- ADAT input provided with optical fiber TOS-LINK connector:
- De-emphasis support for redbook CD compatibility:
- 1HE Half-rack case.



#### Front Panel Layout

- 1 PEAK LEDs. Indicate that the peak signal level on the corresponding channel is exceeding -2d BFS;
- 2 ACTIVE LEDs. Indicate that the signal level on the corresponding channel is above -40 dBFS;
- 3 DE-EMPHASIS switch. Turns on/off the de-emphasis digital filter;
- 4 DE-EMPHASIS ON LED. Indicates that the de-emphasis digital filter is working;
- 5 SAMPLE RATE switch. Selects the sample rate for the de-emphasis filter as 48,0 kHz or 44,1 kHz.
- 6 48,0/44,1 LEDs. Indicate the current selection for the sample rate.
- 7 RESOLUTION switch. Selects the resolution of the digital signal on the ADAT IN port.
- 8 24/16 bit LEDs. Indicate the selected resolution for the digital signal on the ADAT IN port.
- 9 LOCK LED. Indicate that the unit has successfully extracted the wordclock from the digital signal present on the ADAT IN port.
- 10 POWER switch. Turns the unit on and off.
- 11 PWR ON LED. Indicates that the unit is supplied with power and turned on.



Rear Panel Layout

- 1 WC Out BNC connector. You can access here the internal wordclock extracted from the ADAT input;
- 2 12 V AC jack. This is the power supply input. Connect only to an approved power supply;
- 3 EARTH terminal. Use this binding post to ground the chassis of the unit;
- 4 ADAT IN Toslink optical connector. Keep this plug with a protective cover when not in use;
- 5 OUT1–8 XLR connectors. Eight balanced analog outputs. Each output corresponds to an ADAT channel. Pin 1 = chassis ground, Pin 2 = positive, Pin 3 = negative. Clipping level: +20 dBu.

#### Operation

The DA24 unit has a very simple operation mode:

- 1 Connect your digital source using the provided optical fiber cable or an ADAT compatible optical fiber cable to the ADAT IN port from the rear panel;
- 2 Supply the unit with unregulated 12 V AC using the jack marked as 12 V AC from the rear panel;
- 3 Please connect your audio equipment using twisted pair balanced cables provided with XLR connectors to the OUT1-OUT8 outputs from the rear panel;
- 4 Power the unit using the POWER button. The PWR ON led will light up;
- 5 Turn your digital source on;
- 6 In less than one second you should see the LOCK LED turning on. If the LED does not turn on then either you have no signal on the ADAT connection or you digital source plays at 32 kHz or lower frequencies;
- 7 Select the bit resolution of your digital source using the RESOLUTION button. If you are using a common 16-bit ADAT recorder, be sure to turn the Resolution to 16 bits, to mask any noise present in the lower 8 bits:
- 8 Enjoy the true 24 bit sound quality.

#### De-emphasis

The DA24 unit supports CD operation by providing a digital de-emphasis filter. This filter eliminates the high frequency range boost used sometimes at CD recording.

You can activate/deactivate this digital filter by pressing the De-emphasis button. In order to operate properly the digital filter must know the data sample rate. If you know that your digital source is playing at 44,1 kHz please set the Sample Rate at 44,1. If you known that your digital source is playing at 48,0 kHz set the Sample Rate at 48,0.

All time constants of the filter vary proportionally with the sample rate. An erroneous sample rate, although it will not affect the SNR, can have unwanted effects on the sound, since the signal is filtered with the wrong filter.

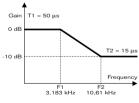


Figure: 1

Interfacing with the DA24: DA24 Analog Outputs DA 24 uses electronically balanced, cross-coupled output buffers. This architecture emulates the output behavior of transformers. Either output can be tied to ground, and the output level will remain the same. This guarantees the maximum level of noise rejection attainable with trasnformerless designs, when connecting to either balanced or unbalanced equipment.

The low impedance (50  $\Omega$ ) and high drive current capability (70 mA typical) of the DA24 output stages enable it to drive very long cables (up to 300 m/1000 ft) without problems.

The balanced configuration is used in professional equipment for it's ability to eliminate noise picked by the long interconnects. Given the symmetrical configuration of the balanced-line transmission chain, all noise will couple equally in the two signal lines. At the receiving end, the difference of the two input voltages will always be the clean input signal. Any asymmetry in the signal path will defeat the noise-rejection of the balanced connection to a certain degree, and should be avoided.

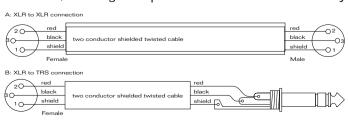
The differential output level of the DA24, corresponding to a 0 dbFS digital sinewave is  $\pm 20$  dBu (7,75V rms). This corresponds to a peak differential output voltage of 11 V. The output voltage range of both DA24's output lines is  $\pm 12$  V. This ensures that a full scale signal can be output without distortion, even with one of the outputs tied to ground, as required when connecting to unbalanced equipment.

DA24 Output Levels

The DA24 is designed to interface directly to professional level (+4 dB) balanced output equipment. The preferred type of connection is via a shielded, twisted-pair cable, with the shield connected to the chassis ground at both ends. Connecting the shield at both ends ensures proper protection against RFI (radio-frequency interference), as well as low frequency interference and should be employed whenever possible. Some balanced equipment uses TRS 1/4 inch jacks instead of the XLR connectors. They are equivalent, with the tip corresponding to pin 2 of the XLR («positive» signal), the ring corresponding to pin 3 («negative» signal) and the sleeve corresponding to pin 1 («ground»).

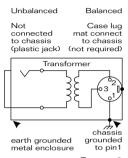
Connecting the DA24 to balanced output equipment

When connecting to «semi-pro» level equipment (-10 dB), the high output of the DA24 will certainly



overdrive the inputs of such gear, resulting in heavy distortion. To avoid this situation, a passive attenuator (pad) or step-down transformer should be used as shown in Figure 2.

# Connecting to unbalanced equipment



Mixing balanced and unbalanced equipment is generally a bad idea, as the two systems aren't compatible. Such mixing is the most frequent cause of hum in audio systems. However, in a non-ideal world, it cannot usually be avoided.

The best way to do it, albeit the most expensive, is to use an isolating transformer (see Figure 3). It can also be used to change the signal levels to «consumer» levels (14 dB of voltage attenuation is achieved by a 5:1 transformer). The alternative to transformer coupling is to use a special cable, set up as shown in Figure 4. If you get hum, try the ground-lifted version in Figure 5. You will almost certainly need include the attenuators shown. There are +4 dB unbalanced units out there, but they are rare.

out there, but they are rare. Figure: 3 A: XLR to RCA connection 2 40 510 kΩ red 20 ٧Ŵ black two conductor shielded twisted cable shield Female B: XLB to TS connection 510 kO 2 kO red black two conductor black shielded twisted cabl shield Figure: 4 A: XLR to RCA connection 2 kΩ \//\\_ 510 kO red 20 black two conductor shielded twisted cable shield Female B: XI B to TS connection red 20 black two conductor shield shielded twisted cabl Figure: 5 10 A: Shield connected to chassis contact on source equipment red red 20-02 black black two conductor shielded twisted cable -0 зО shield shield 10 Fomale Male B: Shield connected via decoupling cap. C = 10 nF film type

two conductor shielded twisted cable

red

black

shield

Female

2 C

10

Figure: 6

30

red

black

shield

Male

Sometimes, balanced connections tend to hum. This Avoiding hum is either a grounding problem, or a ground loop problem. For a detailed explanation, check the «Where does the hum come from » chapter below. In a nutshell, to eliminate the hum, try the following:

- Check that all equipment is properly earthed. Equipment with a line plug is usually earthed through that. Check the earth on the mains socket: Equipment with outboard power supplies (like the AD24) is not earthed through its power connection. It must be grounded elsewhere, either through the cable shield to a properly earthed unit, or directly, using the binding post on the back.
- 2 Try toggling ground-lift switches on related units. Use this step with caution, as it can induce problems in other parts of the system.
- 3 If all else fails, you may need to lift the shield on one end of the interconnections. If you already have an established shield-lifting practice, use that. If not, we recommend lifting the ground at the transmitter end. This will provide better RFI protection. Try the cable configuration in Figure 6 A, B, C – in that order.

#### 8 CHANNEL 24 BIT DIGITAL/ANALOG CONVERTER

#### **Specifications**

#### Resolution

24/16 bits

Dynamic performance

Signal to noise ratio: 115 dB EIAJ

Dynamic Range: 106 dB (A-weighted, 24-bit)

103 dB (unweighted, 24-bit) 96 dB (A-weighted, 16-bit)

94 dB (unweighted, 16-bit)

Total harmonic

distortion & noise: -97 dB 24-bit @ 0 dB

-83 dB 24-bit @ -20 dB -43 dB 24-bit @ -60 dB -93 dB 16-bit @ 0 dB -74 dB 16-bit @ -20 dB

-34 dB 16-bit @ -60 dB

Inter-channel isolation: 110 dB

Combined Digital and Analog Filter Characteristics

Frequerncy response: ±0,1 dB, 10 Hz to 20 kHz

Deviation from

linear phase:  $\pm 0.5 \text{ deg}$ 

Passband

to -0.1dB corner: 0-21770 Hz @ 48.0 kHz

0-19935 Hz @ 44,1 kHz

Passband ripple:  $\pm 0.01 \text{ dB}$ 

Stop Band: 26 230 Hz @ 48,0 kHz

24 100 Hz @ 44,1 kHz

Stop Band Attenuation: 72 dB

Group Delay: 520 µs @ 48,0 kHz

567 µs @ 44,1 kHz

De-emphasis Error:  $\pm 0.3 \text{ dB}$ 

**Analog Outputs** 

Configuration: Cross-coupled balanced

Differential full scale

ouput voltage: 7,75 Vrms

Output voltage range: ±12 V each output

Power supply

rejection ratio: 60 dB

Output impedance:  $50 \Omega$ 

Output short-circuit

current: 70 mA

Output drive capability: 300 m

Wordclock output

Type: BNC

Impedance:  $75 \Omega$ 

Voltage Level: 0–5 V

**ADAT** input

Type: Toslink optical

Format: 8-channel, 24-bit

Power supply requirements

Input voltage: 12 V AC +10/-15%

Maximum current

consumption: 0,8 A

Other information

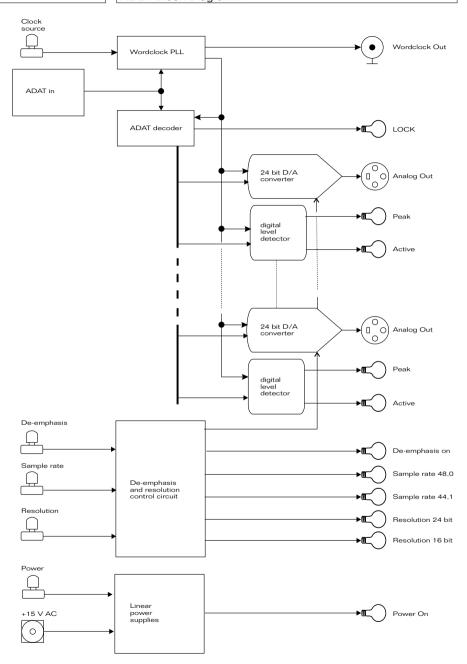
Unit size: 230 x 250 x 42,5 mm

Unit weight: 1,8 kg

Operating temperature

range: 0–40 °C

Operating humidity: 0–90 % non-condensing



### Limited Warranty on Hardware (

Swissonic AG warrant this equipment against defects in materials and workmanship for a period of twelve months from the date of original retail purchase. If you discover a defect, first write or call Swissonic AG at (0041) 55 285 86 10 to obtain a Return Merchandise Authorization Number. No service will be performed on any product returned without prior authorization. Swissonic AG will, at its option, repair or replace the product at no charge to you, provided you return it during the warranty period, with transportation charges prepaid to Swissonic AG. Gewerbezentrum Rotfarb, 8730 Uznach, Switzerland. You must use the product's original packing material for in shipment, and insure the shipment for the value of the product. Please include your name, address, telephone number, a description of the problem, and the original, dated bill of sale with the returned unit and print the Return Merchandise Authorization Number on the outside of the below the shipping address. This warranty does not apply if the equipment has been damaged by accident, abuse, misuse, or misapplication; has been modified without the written permission of Swissonic AG, or if the product serial number has been removed or defaced. All implied warranties, including implied warranties of merchantability and fitness for a particular purpose, are limited in duration to one year from the date of the original retail purchase of this product. The warranty and remedies set forth above are exclusive and in lieu of all others. oral or written, express or implied. No Swissonic distributor, dealer, agent, or employee is authorized to make any modification, extension, or addition to this warranty. Swissonic AG is not responsible for special, incidental, or consequential damses resulting from any breach of warranty, or under any legal theory, including lost profits, downtime, goodwill, damage or replacement of equipment and property and cost of recovering reprogramming, or reproducing any program or data stored in or used with Swissonic products. Some states do not allow the exclusion or of implied warranties or liability for incidental or consequential damages, so the above limitation or exclusion may not apply to you. This warranty gives you specific legal rights, and you may have other rights which vary from state to state.

This equipment has been tested and found to comply with the limits for a class B digital device, pursuant to part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference in a residental installation. This equipment generates, ises, and can radiate radio frequency emergency and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. However, there is no quarantee that interference will not occur in a particular installation. If this equipment does cause interference to radio or television equipment reception, which can be turning the equipment off and on, the user is encouraged to correct the interference by any combination of the following measures:

- Relocate or reorient the receiving antenna
- Increase the separation between the equipment and the receiver
- Plug the equipment into an outlet on a circuit different from that to which the receiver is connected

If necessary, you can consult a dealer or experienced radio/television technician for additional assistance.

PLEASE NOTE: only equipment certified to comply with Class B (computer input/output devices, terminals, printers etc) should be attached to this equipment, and it must have sheilded interface cables in order to comply with the Class B FCC limits on RF emissions.

WARNING: changes or modifications to this unit not expressly approved by the party responsible for compliance could voide the user's authority to operate the equipment.

